Development of an Underrunning System for Moored Longlines

John Melindy and Eric Way

Fisheries Development Branch
Newfoundland Region
P.O. Box 5667
St. John's, Newfoundland
A1C 5X1

June 1986

Canadian Technical Report of Fisheries and Aquatic Sciences No. 1454

86-06497/

Canadian Technical Report of Fisheries and Aquatic Sciences

Technical reports contain scientific and technical information that contributes to existing knowledge but which is not normally appropriate for primary literature. Technical reports are directed primarily toward a worldwide audience and have an international distribution. No restriction is placed on subject matter and the series reflects the broad interests and policies of the Department of Fisheries and Oceans, namely, fisheries and aquatic sciences.

Technical reports may be cited as full publications. The correct citation appears above the abstract of each report. Each report is abstracted in *Aquatic Sciences and Fisheries Abstracts* and indexed in the Department's annual index to scientific and technical publications.

Numbers 1–456 in this series were issued as Technical Reports of the Fisheries Research Board of Canada. Numbers 457–714 were issued as Department of the Environment, Fisheries and Marine Service, Research and Development Directorate Technical Reports. Numbers 715–924 were issued as Department of Fisheries and the Environment, Fisheries and Marine Service Technical Reports. The current series name was changed with report number 925.

Technical reports are produced regionally but are numbered nationally. Requests for individual reports will be filled by the issuing establishment listed on the front cover and title page. Out-of-stock reports will be supplied for a fee by commercial agents.

Rapport technique canadien des sciences halieutiques et aquatiques

Les rapports techniques contiennent des renseignements scientifiques et techniques qui constituent une contribution aux connaissances actuelles, mais qui ne sont pas normalement appropriés pour la publication dans un journal scientifique. Les rapports techniques sont destinés essentiellement à un public international et ils sont distribués à cet échelon. Il n'y a aucune restriction quant au sujet; de fait, la série reflète la vaste gamme des intérêts et des politiques du ministère des Pêches et des Océans, c'est-à-dire les sciences halieutiques et aquatiques.

Les rapports techniques peuvent être cités comme des publications complètes. Le titre exact paraît au-dessus du résumé de chaque rapport. Les rapports techniques sont résumés dans la revue *Résumés des sciences aquatiques et halieutiques*, et ils sont classés dans l'index annual des publications scientifiques et techniques du Ministère.

Les numéros 1 à 456 de cette série ont été publiés à titre de rapports techniques de l'Office des recherches sur les pêcheries du Canada. Les numéros 457 à 714 sont parus à titre de rapports techniques de la Direction générale de la recherche et du développement, Service des pêches et de la mer, ministère de l'Environnement. Les numéros 715 à 924 ont été publiés à titre de rapports techniques du Service des pêches et de la mer, ministère des Pêches et de l'Environnement. Le nom actuel de la série a été établi lors de la parution du numéro 925.

Les rapports techniques sont produits à l'échelon régional, mais numérotés à l'échelon national. Les demandes de rapports seront satisfaites par l'établissement auteur dont le nom figure sur la couverture et la page du titre. Les rapports épuisés seront fournis contre rétribution par des agents commerciaux.

Canadian Technical Report of

Fisheries and Aquatic Sciences No. 1454

June 1986

DEVELOPMENT OF AN UNDERRUNNING SYSTEM FOR MOORED LONGLINES

by

John Melindy[1] and Eric Way

Fisheries Development Branch

Newfoundland Region

P.O. Box 5667

St. John's, Newfoundland

A1C 5X1

[1]John Melindy, Aspen Cove, under contract to Department of Fisheries and Oceans during this project.

©Minister of Supply and Services Canada 1986

Cat. No. Fs 97-6/1454E ISSN 0706-6457

Correct citation for this publication:

Melindy, J., E. Way. 1986. Development of An Underrunning System for Moored Longlines. Can. Tech. Rep. Fish. Aquat. Sci. 1454: 19 p.

TABLE OF CONTENTS

	PAGE
Abstract	iv
Introduction	1
Moored Longline	2
Development of Underrunner	3
Operation of the Underrunning System	6
Discussion	7
Appendix - Photographs of Underruning System	17

LIST OF FIGURES

		PAGE
Figure 1.	Moored Trawl (Fishing Mode)	9
Figure 2.	Moored Trawl (Hauling Mode)	10
Figure 3.	Present Braking System (Thole-Pin)	11
Figure 4.	Present Braking System (Cleat)	12
Figure 5.	Arrangement of Line Brake	13
Figure 6.	Present Underrunning System	14
Figure 7.	Operation of Underrunner	15
Figure 8.	Procedure for Correct Orientation of Boat for Hauling	16

NOTE: Figures 1-8 drawn by Doreen Stacey from sketches supplied by John Melindy and Eric Way.

ABSTRACT

Melindy, John and E. Way. June 1986. Development of an Underrunning System for Moored Longlines. Can. Tech. Rep. Fish. Aquat. Sci. 1454: 19 p.

In response to a request received by the fishermen of Lumsden, Nfld., for an inexpensive braking system to take monofilament longline, the Fisheries Development Branch of the Department of Fisheries and Oceans funded and developed an underrunning moored-longline braking system.

This report describes the tests and design modifications beginning with the first prototypical unit on August 21, 1985. The report further traces the development and design assistance of Mr. Gerald Burry (St. Phillips, Nfld.) and subsequent trials.

Conclusions reached have been inconclusive due to poor weather conditions during the 1985 testing period. However, continued usage of the system by Mr. Melindy has indicated that the system has commercial applications.

RÉSUMÉ

Melindy, John and E. Way. June 1986. Development of an Underrunning System for Moored Longlines. Can. Tech. Rep. Fish. Aquat. Sci. 1454: 19 p.

Suite à une demande faite par les pêcheurs de Lumsden (Terre-Neuve) concernant un système de freinage peu coûteux pour palangre à monofilament, la Direction du développement des pêches a financé et mis au point un système de freinage pour palangre amarré fonctionnant par glissement descendant.

Le présent rapport décrit les tests et les modifications de conception qui ont débuté avec le premier prototype le 21 août 1985. Le rapport, en outre, retrace la mise au point et l'aide pour la conception de M. Gerald Burry (St. Phillips, T.-N.) et les essais ultérieurs.

Les conclusions auxquelles on en est arrivé sont peu concluantes en raison des mauvaises conditions météorologiques au cours de la période d'essai de 1985. Cependant, l'usage continu du système par M. Melindy a montré que le système a des applications commerciales.

INTRODUCTION

Moored longlining is an important fishing technique in many parts of Newfoundland and Labrador. This is especially true along the Strait Shore of the North-East coast of Newfoundland where every year several hundred boats 4.9 to 6.7 m (16'-22') participate in this hook and line fishery from early August to mid-October. These fishermen often use this method to earn as much as 50% of their fishing income.

The only significant change in this century old way of fishing occurred in the early 1980's with the introduction of monofilament lines and swivels.

Monofilament lines have brought mixed blessings, catch rates increased but so has the danger of hauling. The monofilament longlines are smaller and much more difficult to hold than regular spun nylon groundlines. Every fisherman has a story about removing a hook from his hand.

During a meeting in April 1985 with Mr. Eric Way, Technical Development Officer with the Development and Analysis Division, Fisheries Development Branch, fishermen from Lumsden requested that the Department develop a cheap adequate braking system to handle moored monofilament longlines. Subsequently funding through the Development Branch was made available for the project.

MOORED LONGLINE

Moored longlines (Fig. 1 & 2), which are referred to as trawls along the Straight Shore, are moored for the entire fishing season over choice fishing grounds. Each boat fishes eight to 10 trawls which are three to five lines long. Weights and floats are added after approximately every 20 hooks in order to suspend the trawl 1 to 2 fathoms from the bottom. The gear is suspended to decrease the amount of bait which is robbed by noncommercial species, i.e. crabs, sea urchins, star fish.

Enterprises using this technique tend to be one or two man operations. In the case of a one man operation, the individual has to haul the trawl, remove fish and rebait. In a two-man operation, one man hauls the trawl while the other removes fish and rebaits. When wind and tides become negative factors a system involving either thole pins or cleats are used to control the lines (Fig. 3 & 4). This seriously limits the conditions under which fishing operations can be conducted as the existing system becomes unsafe and difficult to operate due to excessive strain on the line.

DEVELOPMENT OF THE UNDERRUNNER

Many fishermen were consulted during the life of the project. From the beginning they specified the unit should be compact, provide absolute braking and remain within the ability of a fisherman to purchase or construct himself.

A hauling feature was considered nonessential since it would increase the unit cost. However, as the project progressed the hauling feature proved to complement the braking and was incorporated.

Fair leads which replaced thole pins also were included and provided for uninterrupted operation.

The first unit (Fig. 5) was built in St. John's by Marine Sales and Services. It was based on a prototype designed by Eric Way, Development and Analysis Division, Fisheries Development Branch.

It was intended to be used only when the need for safety became obvious, otherwise fishermen would haul the conventional way. This device consisted basically of a 31 cm (12') sheave and a foot operated brake. When the brake was employed the sheave was intended to resist the movement of the groundline thus providing safety to the fisherman while he was removing fish and rebaiting hooks. Once the brake was released the force of the wind and tide moves the boat along the line (Fig. 8).

On August 21 the unit was installed onboard a 6.7 m (22') boat in Lumsden. For the next few days calm conditions prevented proper testing of the unit.

After a couple of days of trial in moderate wind and tide, certain conclusions were formed:

1. Preventing the sheave from turning provided sufficient braking.
2. Operating the foot brake restricted the fisherman's movement when gaffing a fish or removing it from a hook.
3. Frequently a hook would become positioned in the sheave in such a manner as to cause the groundline to slip out thus creating a dangerous situation.
4. Too many hooks were still being snagged in the boat.
5. To ensure safety, while standing close to the unit the operator had to carefully avoid every hook while still having absolute control of the operation.
6. The system should have the ability to haul from both sides of the boat.
7. The best results were achieved by permanently braking the unit, hauling the trawl by hand, and placing it in the sheave when it was desired to stop the operation. However, there was too much danger involved in removing the groundline from the sheave to continue hauling.

The next phase in the development of the "underrunner" took place in St. Phillips, Conception Bay. Gerald Burry who developed the Burry Easy Slide Random Baiting System had over the years given considerable thought to a similar underrunning unit, so he was approached to help solve some problems.

During the period from September 14 to September 20 alterations were made to the unit and fishing trials were conducted.

The primary concern was the ability of the unit to significantly improve safety. A brake was developed that could be activated at a distance from the sheave (Fig. 6 & 7). Turning the brake in a clockwise direction created friction between it and a drum which was attached to the sheave. The friction would prevent the sheave from turning.

A hook separator was added to prevent the hooks bridging the grove in the sheave and displacing the groundline.

A hauling wheel was attached to the drum. This ensures the fisherman has total control of the operation. In addition fair leads were added for three reasons:

1. To enhance safety.
2. To provide accurate orientation of the groundline.
3. To prevent hooks from snagging, thereby ensuring an uninterrupted operation.

Except for a couple of problems, the underrunning system was performing satisfactorily after 3 days of fishing trials. There still existed the danger of the groundline slipping when the boat was rolling. The other concern was for the best arrangement to permit hauling from either side of the boat. Several options were available:

1. Interchange the arm roller and the hook separator when necessary.
2. Turn the unit 180°.
3. Eliminate the hook separator and replace it with another arm roller, thus creating complete symmetry in the system.

On the basis of several further trials in Lumsden, it was decided the best approach to solving the problems of potential slippage and reverse hauling was to eliminate the hook separator. The problem which the hook separator was intended to correct (groundline slipping from sheave) was remedied with the incorporation of the hauling function as shown in Fig. 7. The operator now had the ability to control the rate and direction of hauling and therefore stop hauling if a problem arose.

During two days fishing after the hook separator was replaced by the second arm roller, the problem of hook bridging the grove of the sheave was eliminated. This was partially due to snoods that were potential problems.

The calm weather over the next couple of weeks did not permit further useful testing.

OPERATION OF THE UNDERRUNNING SYSTEM

The underrunner as it exists (Fig. 6 and 7) performs best by hauling to the leeward (Fig. 8) with the trawl weighted correctly (2 lb weight every 15 to 20 hooks). Hauling to windward and without adequate weight might result in the trawl wrapping around the sheave. In future it may be necessary to add a sheave knife.

Before commencing, the fisherman has to determine which side of the boat the trawl has to come in over. If he makes the wrong decision, the boat will probably turn around by the wind and tide and create a tangle. Figure 8 outlines the recommended procedures for this fishing technique.

To commence hauling, the groundline is placed in the sheave, underneath the arm rollers, and through the fair leads.

It is necessary to use the hauling wheel to control the drift of the boat along the line. Otherwise the hauling wheel is used to control the rate of hauling and can be helpful for braking and removal of fish.

Turning the brake clockwise until tight ensures braking. It is suggested to hold the handle of the hauling wheel with one hand and operate the brake with the other. Once the brake has been tightened, turn the hauling wheel clockwise as an added precaution.

Before the swivel reaches the required stop, remove fish and untangle the snood. The hook can be baited at this point then placed over the drum to prevent tangling in sheave. Note: Snoods should be less than 16".

Weights have to be hauled onboard and placed over the opposite side. Floats can be passed through the system with one hand while using the other hand to operate the hauling wheel.

DISCUSSION

In its present state, the "underrunning system" appears to perform its intended function and compared with the conventional method of hauling a moored monofilament longlining, it offers certain advantages:

1. Less risk to the operator when hauling in wind and tide.
2. Faster hauling time, presently (depending on the amount of fish) it takes 45 to 60 minutes to haul a three line trawl. The underrunner could save 10 to 15 minutes per longline.

3. Fishermen could increase the amount of gear being fished.
4. It requires only one person for the operation.
5. It permits the use of a larger boat (20'-22').

Poor weather conditions prevented the extensive trials needed to draw more definite conclusions. However, fishermen who have had an opportunity to observe the system in operation were impressed. The operator plans to continue fishing the system during the 1986 fishing season.

MOORED LONGLINES

(FISHING MODE)

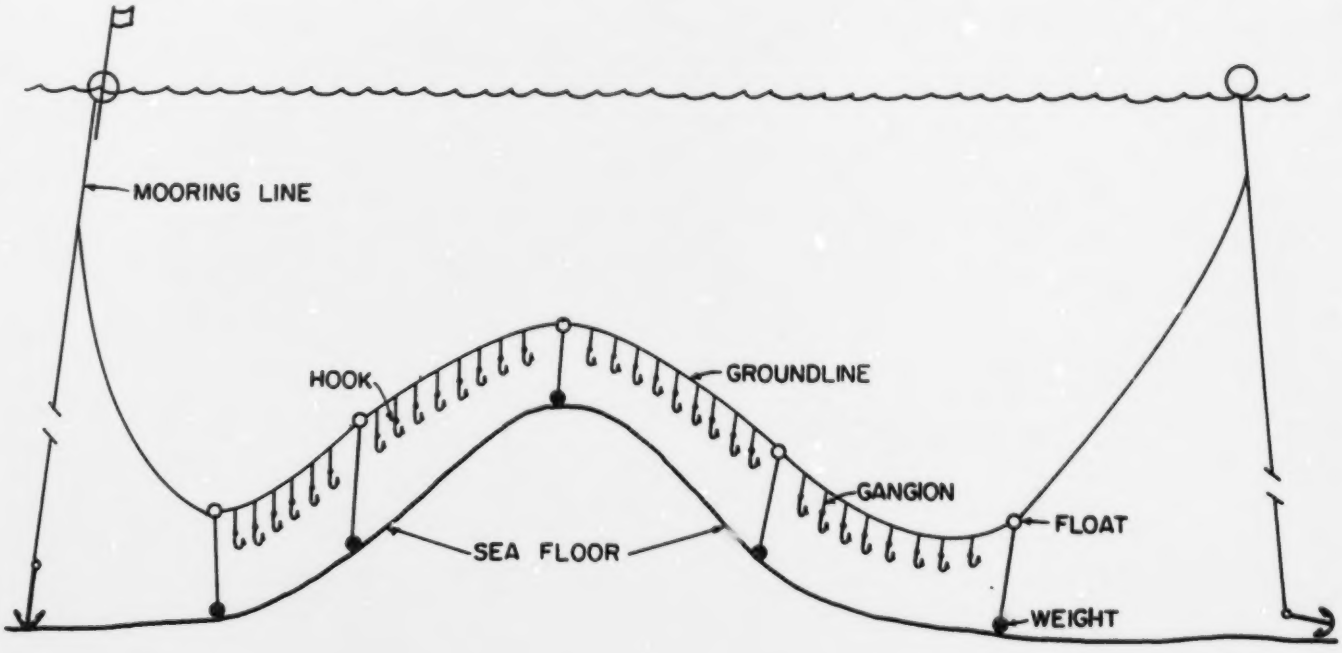


Fig. 1.

MOORED LONGLINES

(HAULING MODE)

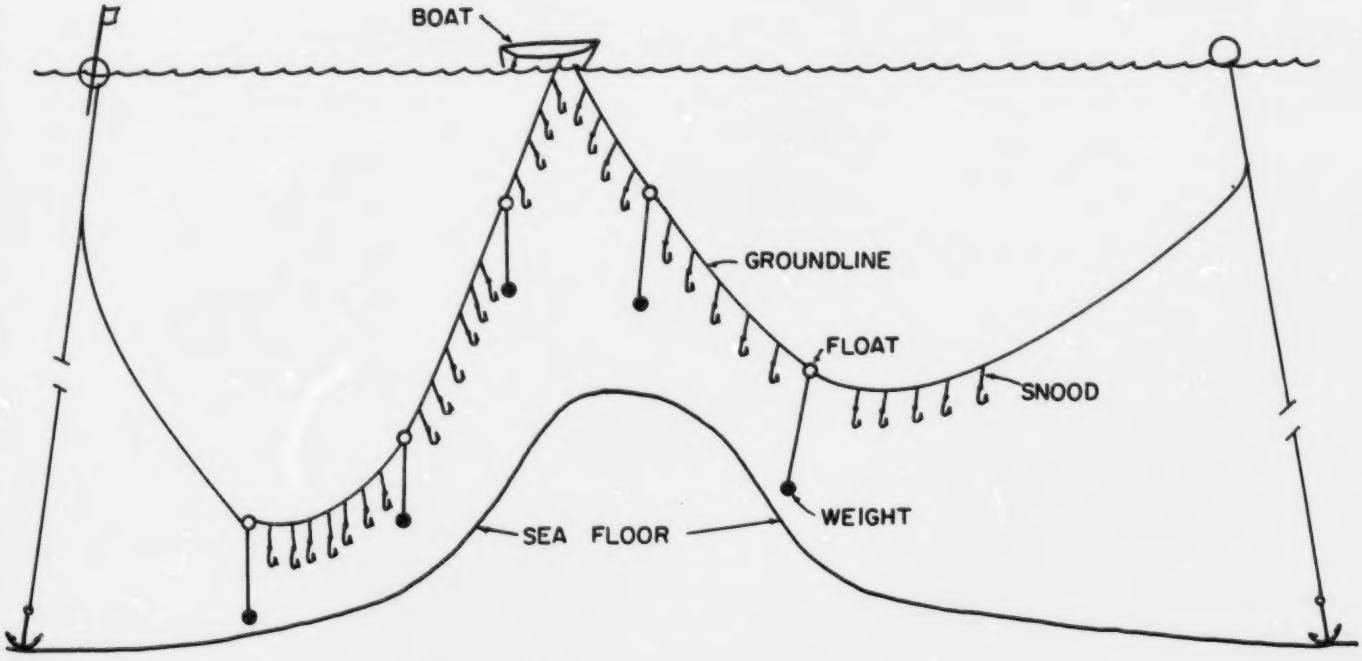
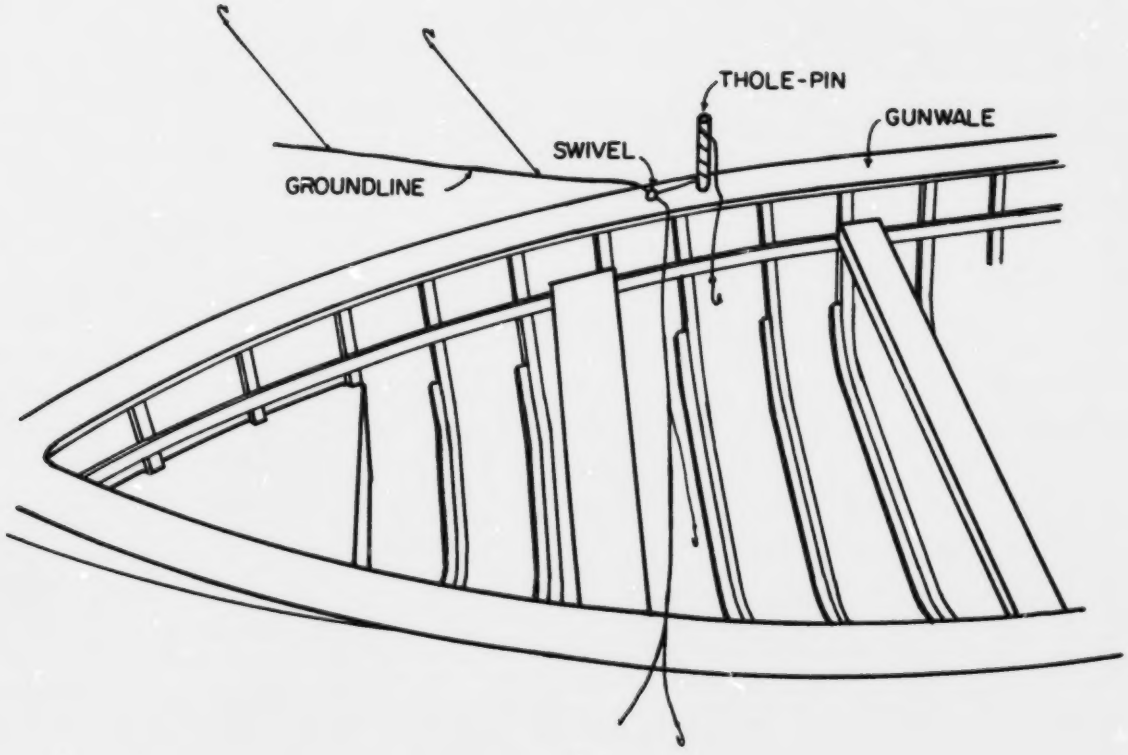


Fig. 2.

PRESENT BRAKING SYSTEM (Thole-pin)

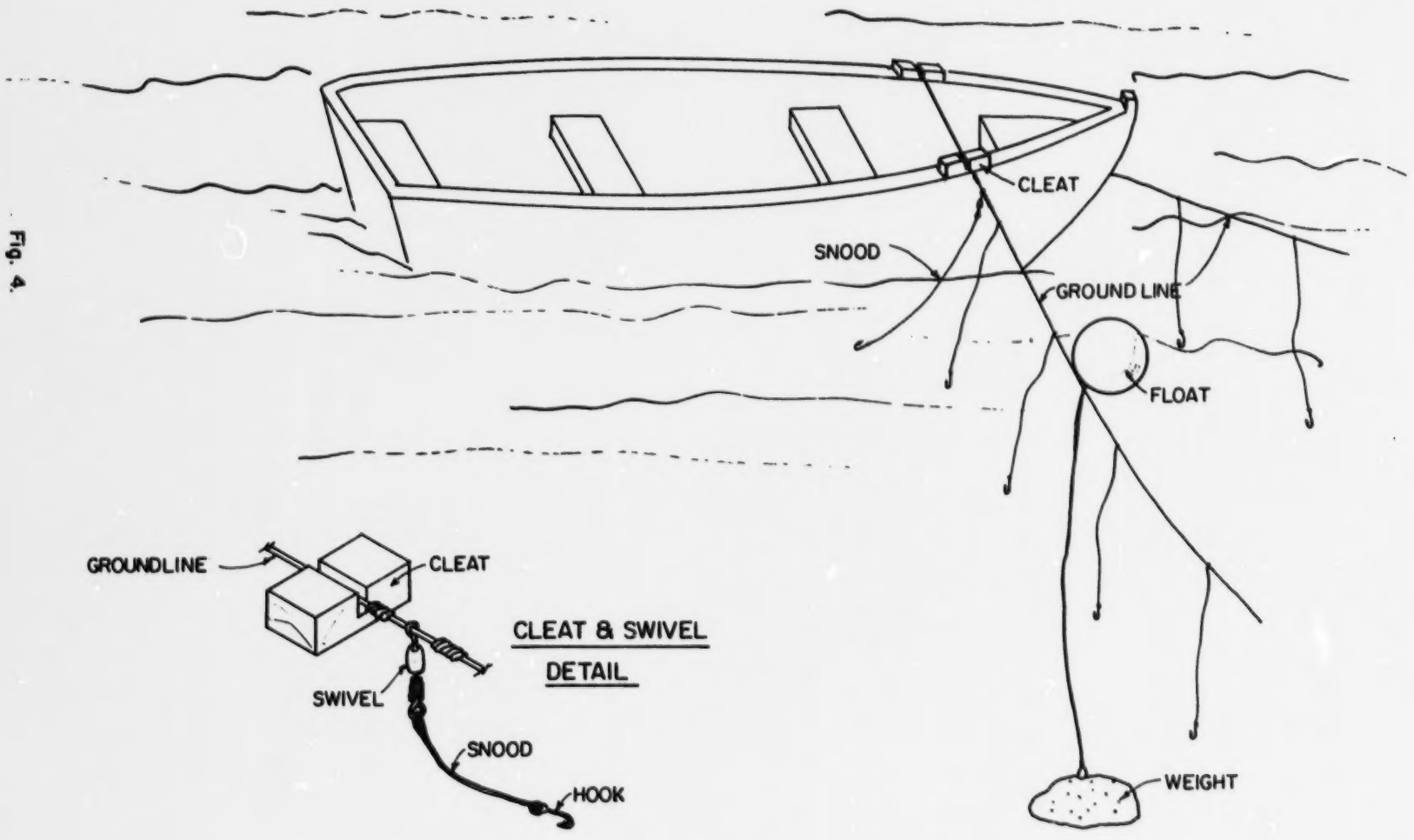


THE SNOOD IS WRAPED AROUND THE THOLE-PIN THREE OR FOUR TIMES AND KEPT TIGHT, THIS PREVENTS THE BOAT FROM MOVING.

Fig. 3.

PRESENT BRAKING SYSTEM (Cleat)

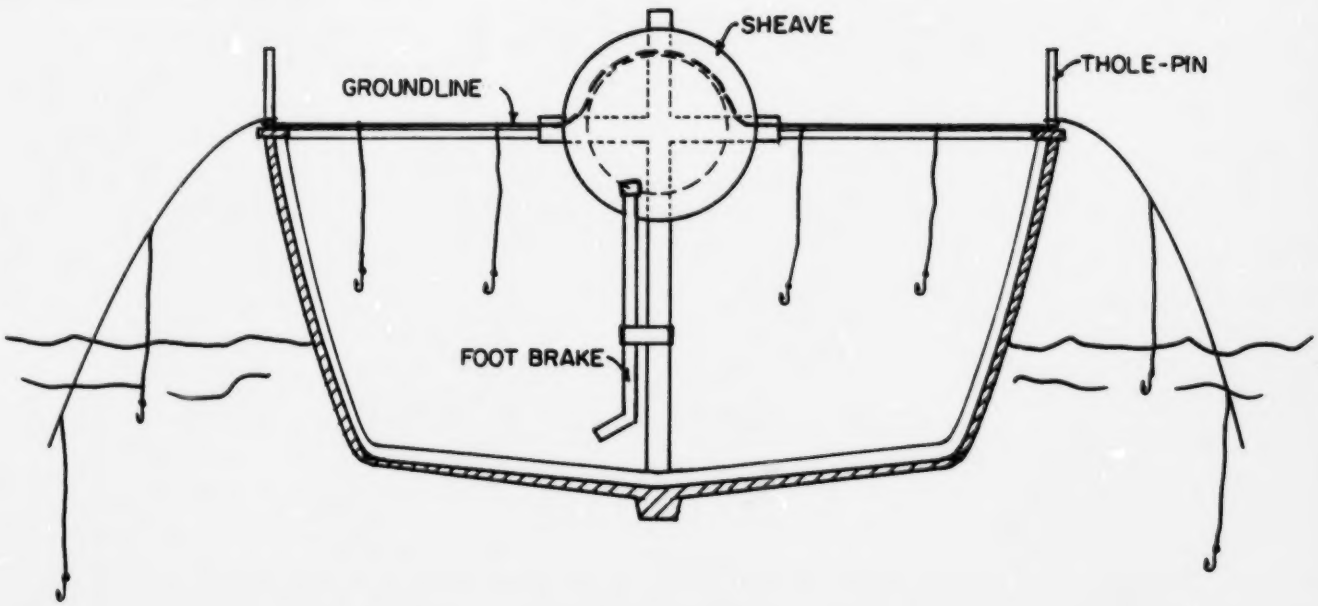
THE SWIVEL IS LARGER THEN THE SLOT IN THE CLEAT. PLACING THE GROUNDLINE IN THE SLOT PROVIDES BRAKING ONCE THE SWIVEL COMES IN CONTACT WITH THE CLEAT.



CLEAT & SWIVEL DETAIL

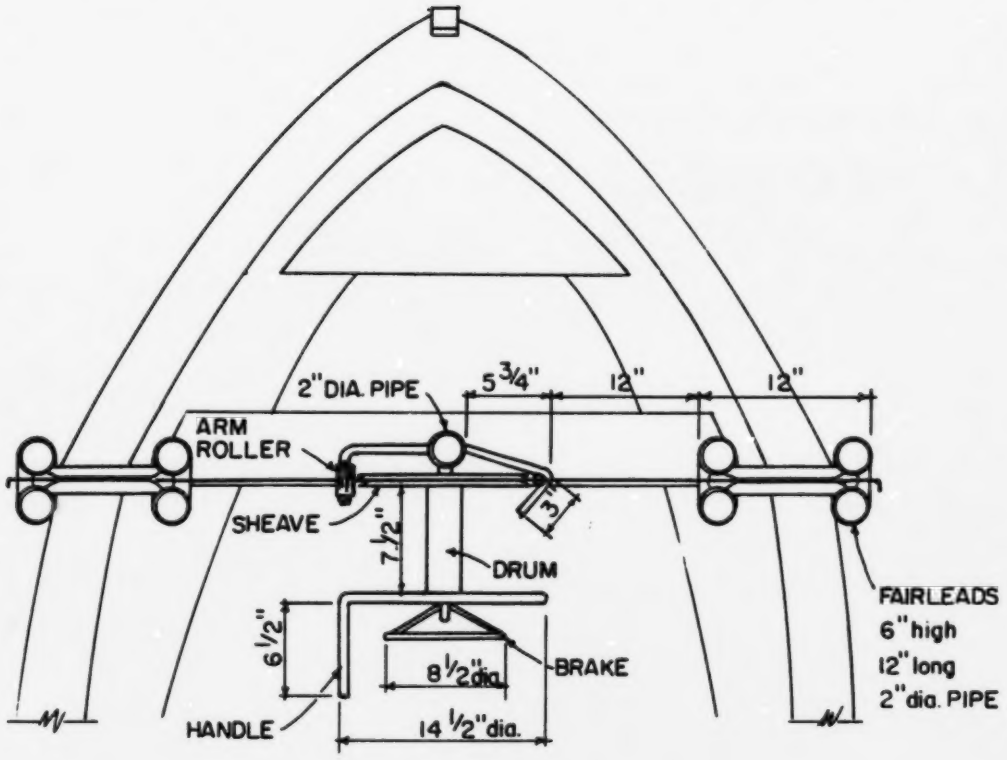
Fig. 4.

'86



ARRANGEMENT OF LINE BRAKE

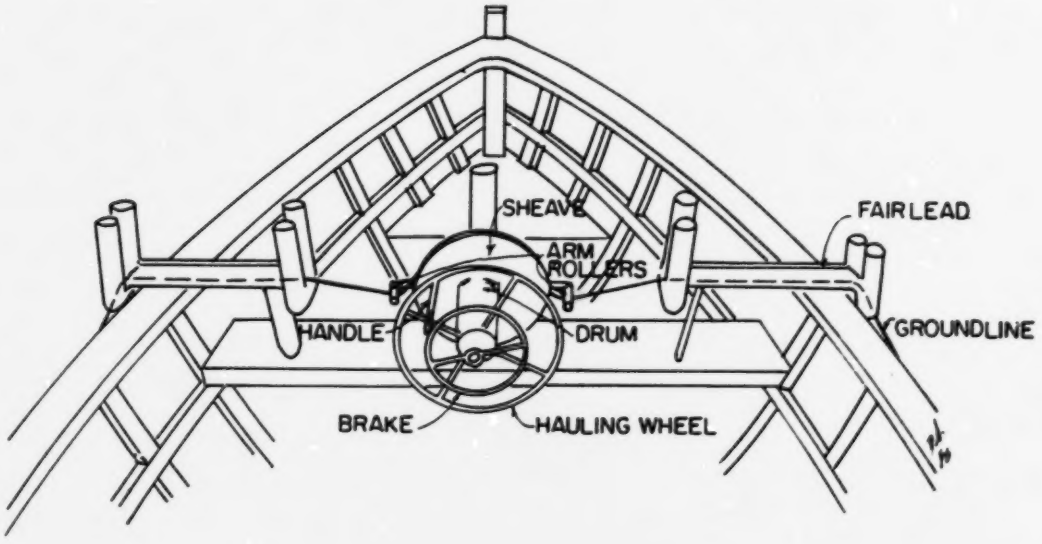
Fig. 5.



PRESENT UNDER RUNNING SYSTEM

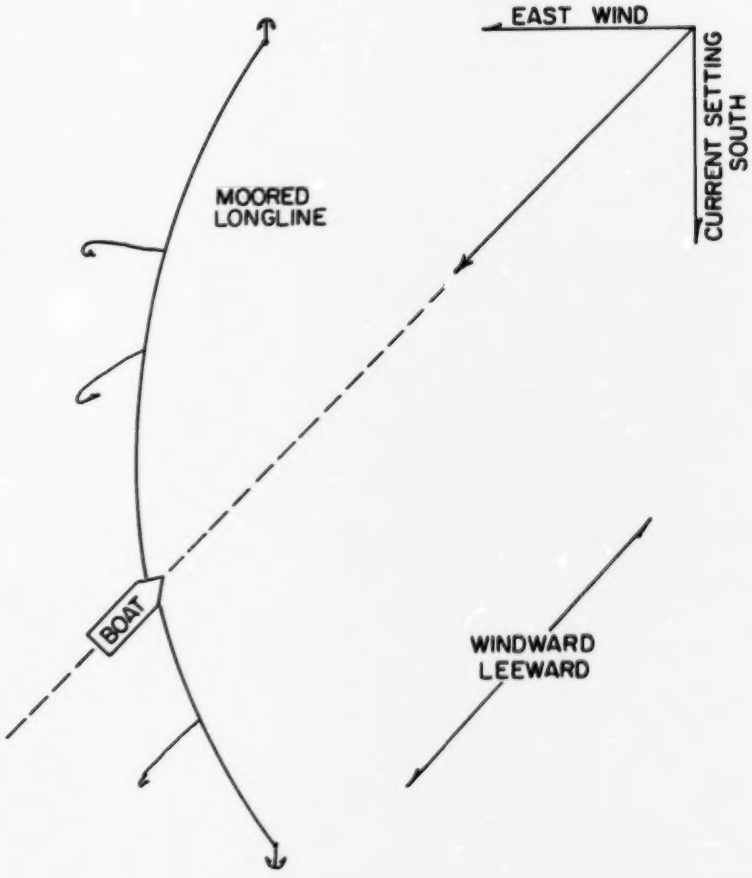
Fig. 6

OPERATION OF THE UNDER RUNNER



BECAUSE OF THE SYMMETRY OF THE SYSTEM THE LONGLINE CAN BE HAULED FROM EITHER SIDE OF THE BOAT.

Fig. 7



Resulting direction a floating object would drift if the easterly wind and southerly current were equal in force and perpendicular in direction. It is possible for the effect of the wind and current to be compounded or to cancel each other.

When hauling a moored longline leeward means the path of least resistance.

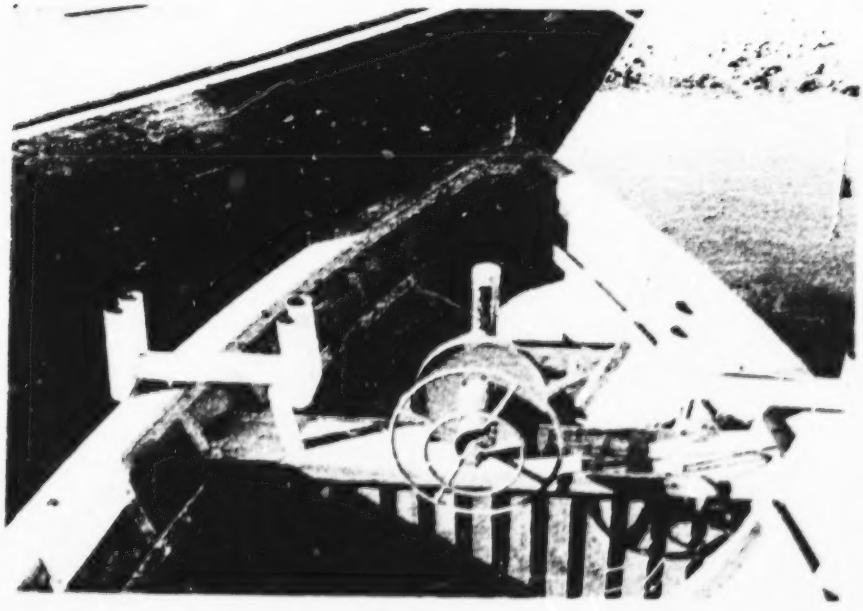
Longlines are set across the prevailing current (tide) and wind. When hauling, the lines take the shape of a bow which helps to avoid tangles. They are always hauled in the forward section of a boat to allow the boat to orient itself to the path of least resistance, which is the fore and aft line of the boat in line with the resulting effect of the interaction of wind and tide.

There was concern the underrunning system might have to be swiveled to avoid extra strain on the longline. However, fishing trials to date have proved otherwise.

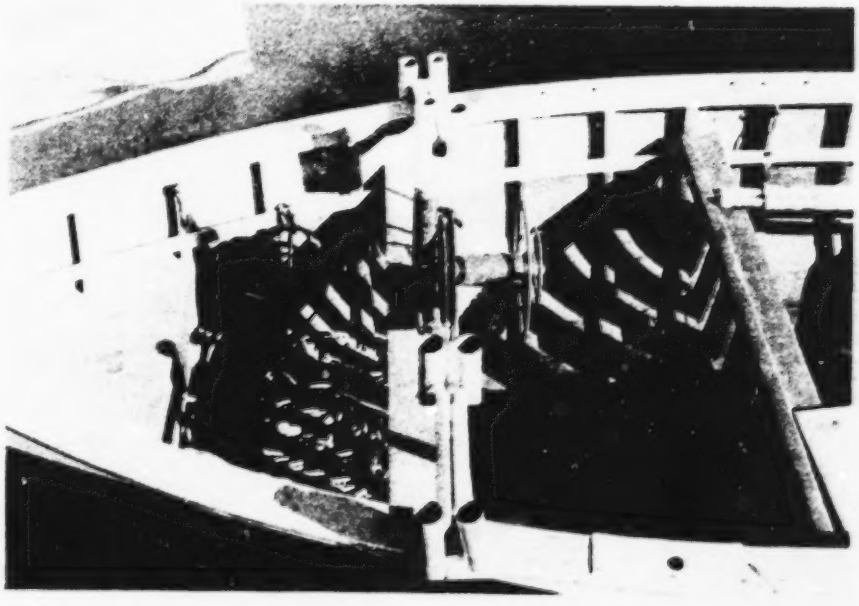
Fig. 8

APPENDIX

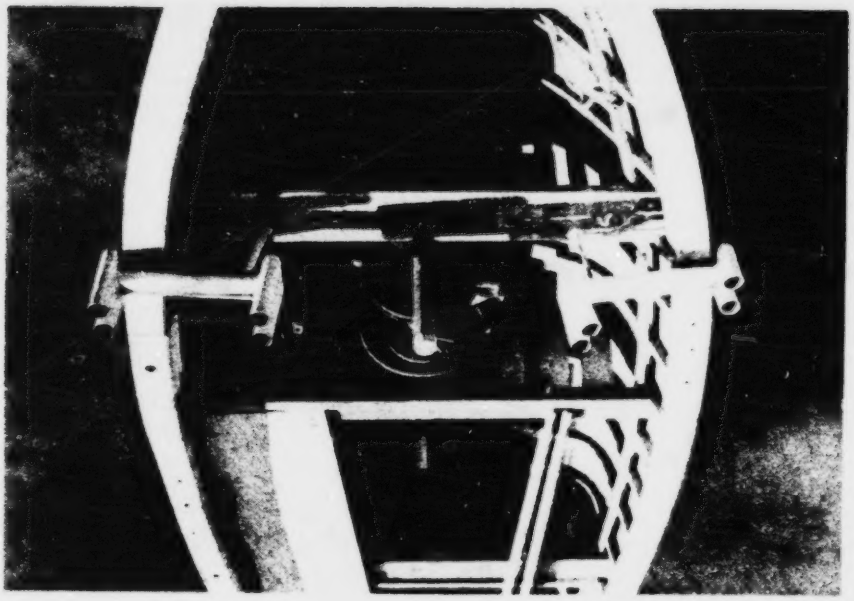
UNDER RUNNING SYSTEM



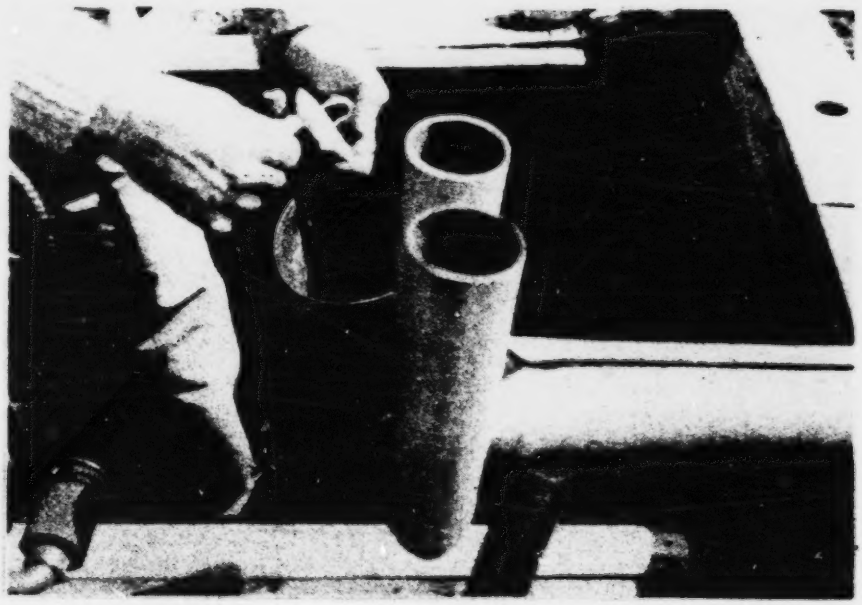
FRONT VIEW



SIDE VIEW



BACK VIEW



BAITING HOOK